

# Prevalence of Anaemia and Associated Risk Factors in Pregnant Women in the 3rd Trimester of Pregnancy

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## ABSTRACT

**Background:** Anaemia in pregnancy is a significant public health problem, especially in low and middle-income countries. This study aimed to assess the prevalence of anaemia and its associated risk factors among pregnant women in the third trimester of pregnancy in Bangladesh. **Methods & Materials:** This cross-sectional study was carried out at the Department of Medicine, General Hospital (Victoria), Narayanganj, Bangladesh from January 2024 to December 2024, on 80 pregnant women in their third trimester. Data on socio-demographic, obstetric, clinical, nutritional, and antenatal care were obtained from a structured questionnaire. Haemoglobin was measured, and anaemia was defined as per the WHO criteria. Data were entered and analyzed on SPSS version 26. **Results:** The overall prevalence of anaemia was 57.5%, mild (30%), moderate (25%), and severe (2.5%). On multivariable logistic regression, significant independent predictors included irregular or absent iron-folic acid supplementation (AOR 4.28; 95% CI: 1.55-11.84), poor dietary diversity (AOR 3.76; 95% CI: 1.36-10.39), fewer than four antenatal care visits (AOR 3.45; 95% CI: 1.22-9.77), low monthly family income below 20,000 BDT (AOR 3.12; 95% CI: 1.18-8.26), and rural residence (AOR 2.68; 95% CI: 1.04-6.91). **Conclusions:** Anaemia is very common in the third trimester and is strongly linked to modifiable risk factors. To reduce the burden of anaemia in this population, it is important to strengthen iron-folic acid supplementation programmes, improve dietary diversity, and increase antenatal care utilization.

**Keywords:** Anaemia, Pregnancy, Third trimester, Iron-folic acid supplementation

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## INTRODUCTION

The prevalence of anaemia among pregnant women in Bangladesh is estimated to range from 40% to 60% based on the classification of the World Health Organization, placing the country among those with a severe public health burden of maternal anaemia worldwide [1]. The third trimester of pregnancy is a time of increased physiological demand because of the rapid growth of the fetus, the increase in maternal red cell mass, and the increased iron needs [2]. At this time, low haemoglobin is especially significant because it is strongly linked to poor maternal and neonatal outcomes such as postpartum haemorrhage, preterm labour, intrauterine growth restriction, and low birth weight [3]. In addition, severe anaemia has been identified as a direct cause of maternal mortality and is responsible for a large share of pregnancy-related deaths in developing countries [4]. Anaemia in pregnancy is a complex condition. In addition to nutritional deficiencies, other factors include infections (malaria and helminthiasis), chronic diseases, and haemoglobinopathies [5]. Socio-economic factors such as poverty, low education, rural living, and poor health care access have been consistently found to be important factors in the context of Bangladesh and similar contexts in relation to anaemia. Attendance at antenatal care (ANC) is a key determinant in the prevention and management of anaemia in

pregnancy [6]. Although IFA supplements are widely available in Bangladesh through the national health programme, their use is not consistent, especially among women with lower health literacy, poor socioeconomic status, and limited access to formal health care facilities [7,8]. Nutritional anaemia is also exacerbated by obstetric factors such as multiparity, short birth intervals, and previous abortions, which deplete iron stores in the mother and increase haematological demands with each pregnancy, and by dietary practices including low consumption of iron-rich foods (meat, fish, and eggs) and the regular consumption of tea after meals, which interferes with the absorption of non-haem iron [9,10]. Although the burden of anaemia during pregnancy is known in Bangladesh, there is a lack of facility-based studies that comprehensively assess the prevalence and determinants of anaemia during the third trimester. The available evidence is largely from national surveys, which may not reflect the detailed clinical and socio-economic profile of women who attend tertiary-level health care institutions. This gap needs to be filled to design targeted interventions. Hence, this study was aimed to assess the prevalence of anaemia and associated risk factors among pregnant women in the third trimester attending at a tertiary care center in Bangladesh.

## METHODS & MATERIALS

This is a cross-sectional descriptive study carried out at the Department of Medicine, General Hospital (Victoria), Narayanganj, Bangladesh from January 2024 to December 2024. The study population consisted of pregnant women attending the antenatal care clinic during the data collection period, in the third trimester of pregnancy (gestational age  $\geq 28$  weeks). The total number of participants was 80, obtained by consecutive purposive sampling. The study included women in their third trimester who gave informed written consent, and excluded women with a known history of haemoglobinopathy, chronic systemic illness (e.g., renal or hepatic disease), twin or higher order pregnancy, and those who refused to participate. A pre-tested structured questionnaire was used for data collection, which was conducted face-to-face through interviews and complemented with medical record review. Socio-demographic factors (age, residence, educational status, occupation, monthly family income), obstetric profile (gestational age, gravidity, parity, birth spacing, history of abortion), clinical and nutritional parameters (BMI, pallor, dietary diversity, frequency of protein intake, tea after meals, history of worm infestation), and antenatal care related factors (number of ANC visits, adherence to iron folic acid and calcium supplementation, deworming status, and nutrition counselling

received) were assessed. Haemoglobin was measured using a validated digital haemoglobinometer, and anaemia was defined as non-anaemic (Hb  $\geq 11.0$  g/dL), mild anaemia (Hb 10.0-10.9 g/dL), moderate anaemia (Hb 7.0-9.9 g/dL), and severe anaemia (Hb  $< 7.0$  g/dL) according to WHO criteria. The data were entered and analyzed in SPSS version 26.0. Categorical variables were presented as frequencies and percentages. Chi-square tests were used to examine bivariate associations between risk

factors and anaemia status. Bivariate analysis variables entered into a multivariable binary logistic regression model to determine independent predictors of anaemia, and results were presented as adjusted odds ratios (AOR) with 95% confidence intervals. A p-value of  $< 0.05$  was considered statistically significant.

## RESULTS

Table I shows the socio-demographic profile of the 80 pregnant women who

participated in the study. Most of the participants (37.5%) were between 25 and 29 years of age, and the least (10%) were less than 20 years of age. More than half of the participants (57.5%) resided in rural areas, and 37.5% had completed secondary-level education. Housewife was the most common occupation (85.0%), and almost half (47.5%) of the women had a monthly family income of less than 20,000 BDT, indicating a low-income study population.

**Table I**

Socio-demographic characteristics of the study participants ( $n=80$ ).

Variable	Category	n	%
Age	<20 years	8	10.0
	20-24 years	26	32.5
	25-29 years	30	37.5
	$\geq 30$ years	16	20.0
Residence	Urban	34	42.5
	Rural	46	57.5
Educational status	No formal education	12	15.0
	Primary	24	30.0
	Secondary	30	37.5
	Higher secondary or above	14	17.5
Occupation	Housewife	68	85.0
	Service/other	12	15.0
Monthly family income	<20,000 BDT	38	47.5
	20,000-40,000 BDT	30	37.5
	>40,000 BDT	12	15.0

The obstetric characteristics of the participants are shown in Table II. The 33–36-week gestational age group was the largest (45%), and the 28–32 week and  $\geq 37$ -

week groups were equal (27.5% each). Most of them were multigravida (62.5%) and of these, 56% had a birth spacing of  $\geq 2$  years. In terms of parity, 47.5% were Para 1-2 and

15.0% had a previous history of abortion, indicating a moderate obstetric risk burden in the cohort.

**Table II**

Obstetric profile of the study participants ( $n=80$ ).

Variable	Category	n	%
Gestational age	28-32 weeks	22	27.5
	33-36 weeks	36	45.0
	$\geq 37$ weeks	22	27.5
Gravidity	Primigravida	30	37.5
	Multigravida	50	62.5
Parity	Nulliparous	32	40.0
	Para 1-2	38	47.5
	Para $\geq 3$	10	12.5
Birth spacing among multigravida	<2 years	22	44.0
	$\geq 2$ years	28	56.0
History of previous abortion	Yes	12	15.0
	No	68	85.0

The clinical and nutritional parameters of the study participants are summarized in Table III. Most were of normal BMI (52.5%), but 17.5% were underweight and

30% overweight or obese. Clinical detection of pallor was seen in 47.5% of women. Only 45% of participants had a good dietary diversity and exactly half ate meat, fish or

eggs less than 3 days a week. 42.5% reported drinking tea after meals and 22.5% had a history of worm infestation.

**Table III**Clinical and nutritional profile of the participants ( $n=80$ ).

Variable	Category	n	%
BMI category	Underweight (<18.5)	14	17.5
	Normal (18.5-24.9)	42	52.5
	Overweight/obese ( $\geq 25.0$ )	24	30.0
Pallor	Present	38	47.5
	Absent	42	52.5
Dietary diversity	Poor	36	45.0
	Adequate	44	55.0
Meat/fish/egg intake	<3 days/week	40	50.0
	$\geq 3$ days/week	40	50.0
Tea intake after meals	Yes	34	42.5
	No	46	57.5
History of worm infestation	Yes	18	22.5
	No	62	77.5

Table IV presents ANC attendance and supplementation practices. 57.5% of participants had taken  $\geq 4$  ANC visits as recommended by WHO, while 42.5% had

taken <4 visits. Only 45% of women took iron-folic acid regularly and 37.5% took calcium regularly. There were significant gaps in preventive care delivery, with

deworming having been done in only 35% of participants during the current pregnancy and 60.0% of participants not receiving any formal nutrition counselling.

**Table IV**Antenatal care and supplementation-related factors ( $n=80$ ).

Variable	Category	n	%
Number of ANC visits	<4 visits	34	42.5
	$\geq 4$ visits	46	57.5
Iron-folic acid intake	Irregular/not taking	36	45.0
	Regular	44	55.0
Calcium supplementation	Irregular/not taking	30	37.5
	Regular	50	62.5
Deworming during pregnancy	Yes	28	35.0
	No	52	65.0
Received nutrition counseling	Yes	32	40.0
	No	48	60.0

The haemoglobin classification of anaemia in the study population is shown in Table V. The 80 participants included 46 (57.5%) who were anaemic. In the anaemic women,

mild anaemia was the most prevalent (24 women, 30%) followed by moderate anaemia (20 women, 25%). 2.5% of the women had severe anaemia, and 42.5% had

haemoglobin levels in the normal range (11.0 g/dL or higher).

**Table V**Prevalence and severity of anaemia among study participants ( $n=80$ ).

Anaemia status	Haemoglobin level	n	%
Non-anaemic	Hb $\geq 11.0$ g/dL	34	42.5
Mild anaemia	Hb 10.0-10.9 g/dL	24	30.0
Moderate anaemia	Hb 7.0-9.9 g/dL	20	25.0
Severe anaemia	Hb <7.0 g/dL	2	2.5
Total anaemic	Hb <11.0 g/dL	46	57.5

The bivariate associations between selected risk factors and anaemia status are presented in Table VI. The statistically significant associations were found with rural residence ( $p=0.011$ ), monthly income less than 20,000

BDT ( $p=0.006$ ), less than four ANC visits ( $p=0.004$ ), irregular or no iron-folic acid supplementation ( $p=0.001$ ), poor dietary diversity ( $p=0.001$ ), and birth spacing of less than two years ( $p=0.028$ ). The results

highlight socioeconomic, nutritional and health access factors as important correlates of anaemia in this population.

**Table VI**

Association between selected risk factors and anaemia.

Risk factor	Category	Anaemic n=46	Non-anaemic n=34	p-value
Residence	Rural	32 (69.6%)	14 (41.2%)	0.011
	Urban	14 (30.4%)	20 (58.8%)	
Monthly income	<20,000 BDT	28 (60.9%)	10 (29.4%)	0.006
	≥20,000 BDT	18 (39.1%)	24 (70.6%)	
ANC visits	<4 visits	26 (56.5%)	8 (23.5%)	0.004
	≥4 visits	20 (43.5%)	26 (76.5%)	
Iron-folic acid intake	Irregular/not taking	28 (60.9%)	8 (23.5%)	0.001
	Regular	18 (39.1%)	26 (76.5%)	
Dietary diversity	Poor	28 (60.9%)	8 (23.5%)	0.001
	Adequate	18 (39.1%)	26 (76.5%)	
Birth spacing	<2 years	17 (37.0%)	5 (14.7%)	0.028

The results of the multivariable logistic regression analysis are shown in *Table VII*. After adjusting for all covariates, the strongest independent predictor was irregular or absent iron-folic acid intake (AOR 4.28; 95% CI: 1.55-11.84; p=0.005),

followed by poor dietary diversity (AOR 3.76; 95% CI: 1.36-10.39; p=0.011), fewer than four ANC visits (AOR 3.45; 95% CI: 1.22-9.77; p=0.019), low monthly income (AOR 3.12; 95% CI: 1.18-8.26; p=0.022), and rural residence (AOR 2.68; 95% CI:

1.04-6.91; p=0.041). The association of birth spacing less than 2 years was not statistically significant on multivariable analysis (AOR 2.41; 95% CI: 0.81-7.15; p=0.112).

**Table VII**

Multivariable logistic regression analysis of factors associated with anaemia.

Variable	Adjusted OR	95% CI	p-value
Rural residence	2.68	1.04-6.91	0.041
Monthly income <20,000 BDT	3.12	1.18-8.26	0.022
<4 ANC visits	3.45	1.22-9.77	0.019
Irregular/no iron-folic acid intake	4.28	1.55-11.84	0.005
Poor dietary diversity	3.76	1.36-10.39	0.011
Birth spacing <2 years	2.41	0.81-7.15	0.112

## DISCUSSION

The high prevalence of anaemia (57.5%) in the third trimester of pregnancy, as found in this study, is similar to the prevalence reported by Thankachan et al. and Rahman et al., conducted in Bangladesh and other comparable South Asian settings, which were predominantly mild-to-moderate anaemia (30% mild and 25% moderate) [11,12]. Although IFA supplementation is available in Bangladesh as part of the Essential Services Package, it is not being used to its full potential, as evidenced by the fact that irregular or no supplementation was the strongest independent predictor of anaemia in this study (AOR 4.28), and by several regional studies that have identified side effects (nausea and constipation), poor counselling, and supply chain issues at peripheral facilities as barriers to uptake [13,14]. This highlights the importance of demand-side measures such as improved health education and community-level IFA distribution strategies. Low consumption of animal-source foods and micronutrient-dense vegetables was a second major independent predictor (AOR 3.76), consistent with the study by Gedefaw et al., who showed that low consumption of animal-source foods and micronutrient-dense vegetables is strongly associated with iron and micronutrient deficiency anaemia during pregnancy [15]. These dietary patterns are deeply rooted in cultural norms and limited by economic constraints, and are targets for nutrition counselling during

ANC visits. Low ANC utilisation (less than 4 visits) was independently associated with 3.45-fold higher odds of anaemia. This is consistent with reports by Haidar et al. and Zerfu et al., where fewer ANC contacts were associated with delayed detection and treatment of anaemia, incomplete supplementation courses, and missed deworming opportunities [16,17]. In our study, 42.5% of women attended fewer than four ANC visits, and 65% had not received deworming during the current pregnancy, highlighting significant gaps in preventive service delivery. Worm infestation is an important secondary preventable cause of anaemia due to blood loss and competition for nutrients. The odds of anaemia were 3.12 times higher in families with low monthly income (less than 20,000 BDT). Poverty restricts food diversity, access to health care, and the ability to purchase additional food and medicines [18]. This socioeconomic gradient in anaemia risk has been consistently observed in low-income settings and highlights the importance of economic empowerment and social protection programmes in the reduction of nutritional anaemia among pregnant women [19]. In this study, rural women were less likely to attend the recommended four ANC visits, less likely to take IFA supplements, and more likely to be infested with worms, indicating that rural-urban inequities in anaemia are mediated through multiple overlapping pathways [20]. Birth spacing less than 2 years was significantly associated

with the outcome on bivariate analysis (p=0.028), but not in the multivariable model (AOR 2.41; p=0.112), indicating that this association may be confounded by other co-occurring risk factors like lower income and multiparity [21]. The results of this study collectively suggest that anaemia in the third trimester in Bangladesh is a result of the interplay of modifiable nutrition, behaviour and health care access-related factors, which are part of a wider socioeconomic inequality. The results have significant policy and programme implications, indicating that a multisectoral approach is needed to achieve a substantial impact on anaemia prevalence among pregnant women in Bangladesh, which includes enhanced ANC service delivery, community-level IFA distribution, dietary diversification counselling, routine deworming, and poverty alleviation.

## LIMITATIONS

The study was conducted in a small sample of 80 participants from a single facility, which may limit the generalisability of the results to the wider pregnant population in Bangladesh. Since a cross-sectional design was used, causal inferences about the risk factors identified cannot be made.

## CONCLUSION

The study demonstrated that anaemia is very common in the third trimester of pregnancy, 57.5% of the participants had anaemia, most of them had mild to moderate anaemia.

Significant independent predictors identified were irregular iron-folic acid supplementation, low family income, poor dietary diversity, and low utilisation of antenatal care in rural areas. The high burden of anaemia is a result of multiple deficiencies at the nutritional, behavioural and healthcare access levels, which are set in a socioeconomic context of poverty and inequality. A coordinated and comprehensive approach is needed to tackle this problem, including increasing adherence to IFA supplementation through community-based distribution and counselling, increasing dietary diversity through culturally appropriate nutrition education, increasing ANC attendance, especially among rural and low-income groups, and addressing structural factors of poverty and gender inequality that contribute to maternal nutritional deficiencies in Bangladesh.

### RECOMMENDATIONS

Larger, multi-centre studies with community-based sampling are needed to obtain more representative prevalence estimates and to explore other aetiological factors like serum ferritin levels, folate status and parasitic infections. Longitudinal studies of the effect of targeted interventions on anaemia outcomes in subsequent pregnancies are also warranted.

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### CONFLICT OF INTEREST

None declared

### ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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